Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB.

Conducted and published for the Club, by

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Vol. 9. August, 1907. No. 104.

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Boston, Mass.
740 Exchange Building.

Providence, R. I.
Preston and Rounds Co.

RHODORA.—A monthly journal of botany, devoted primarily to the flora of New England. Price $1.00 per year ($1.25 to all foreign countries except Canada); single copies 15 cents. Volume 1, $2.00, Vol. 2, $1.50. All remittances by check or draft, except on Boston or New York, must include ten cents additional for cost of collection. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be gladly received and published to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than one page of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to
B. L. ROBINSON, Clement Circle, Cambridge, Mass.

Subscriptions, advertisements, and business communications to
W. P. RICH, 300 Massachusetts Avenue, Boston, Mass.

Single copies may be had from
E. L. RAND, Corresponding Sec'y N. E. Botanical Club,
740 Exchange Building, Boston, Mass.

Entered at Boston, Mass., Post office as Second Class Mail Matter

SYNOPTICAL FLORA OF NORTH AMERICA, by A. GRAY and others. Vol. I. Fascicles 1 and 2. A critical treatment of forty-five families of polypetalæ (*Ranunculaceæ to Polygalaceæ*) 1895-1897. $5.20.—GRAY HERBARIUM of Harvard University, Cambridge, Mass.

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A PARTIAL LIST OF CONNECTICUT DIATOMS WITH SOME ACCOUNT OF THEIR DISTRIBUTION IN CERTAIN PARTS OF THE STATE.

William A. Terry.

Connecticut is rich in diatoms, both in quantity and variety, and fossil deposits are abundant, both of fresh water and marine. The very ancient deposits like those of Virginia and Maryland cannot be expected here, as the great ice sheet during glacial times swept all such as may have existed into the sea, but the time since then has been sufficient for the accumulation of a vast store of material of which very little has ever been investigated. I have found eleven fresh water deposits in Bristol, varying in size from a few rods in diameter to many acres; one in the northern part of the town, "No. 11," covers fifteen acres and possibly much more. The diatomaceous stratum of these deposits is generally three to four feet below the surface, and in the larger deposits averages about two feet in depth, but in No. 11 it is of unknown depth; I have material from ten and a half feet below the surface, showing about seven feet of diatoms to this point; it is especially interesting as it contains numbers of the beautiful *Cyclotella antiqua* W. Sm., which is very rare in this country; all correspondents to whom I have sent it report that they had never seen it before. Dr. Ward sent me a slide with this label from Prof. H. L. Smith's collection which is in his possession, but the forms shown were not the same. The specimens from which Van Heurck made his drawings for his Synopsis must have been very inferior to the Bristol specimens in beauty.

In New Britain Mr. W. R. Stone discovered a fossil deposit in which I found a new *Stauroneis*, the outline of which resembled that of

Navicula amphirhyncus Ehrenb., but exhibited an oblique stauros. This might appropriately have been called *obliqua*, but as Gregory had appropriated this name for an entirely different and much smaller form, I named it *S. nova britannica*, and it was so published in Dr. Bigelow's Observer. Gregory's form was not strictly a *Stauroneis*; it was a very small stauroneiform *Scoliopleura*, and its stauros was not oblique. This New Britain *Stauroneis* is the most rare species of which I have any knowledge; Mr. Stone's original gathering contained some hundreds, perhaps thousands of specimens, but on subsequent investigation no more could be found; they were probably confined to a very thin stratum of the deposit which was not identified, and further exploration is difficult if not impossible as the ground is covered with buildings.

Connecticut waters also are rich in living diatoms, and recent deposits abound. Nearly every lake and pond has its bottom covered with a soft ooze, which is filled with diatoms and is often two or more feet in thickness. The margins of rivers, ditches in the marshes, and the bottoms of small streams and rills in springy mountain pastures, furnish them in abundance. A small stream in a marshy pasture on Fall Mountain in Bristol has an abundant colony of the large variety of *Stauroneis acuta* W. Sm., many times larger than the type of Wm. Smith. I have a slide sent me by Prof. H. L. Smith which he assured me was part of the original gathering from which Tuffen West made the drawing of *S. acuta* for Smith's British Diatomaceae; this is the same as the *Pleurotaenium acutum* of other authors, and is distinctly different from the large Bristol *Stauroneis*. In the colony I find another *Stauroneis* which is quite remarkable; it is longer and more cylindrical than the other species, has a broad stauros and rounded ends with a large saucer-shaped pseudonodule near each end of the upper valve but none on the lower valve. Next to the New Britain *Stauroneis* this is the most rare of all our species of diatoms. They may be gathered in hundreds from a space of about thirty feet on this brook, but they are so much outnumbered by other species with them that it is difficult to find them after they are collected; I have found a single specimen in each of three widely separated ponds in Bristol, but they are known nowhere else. Dr. Ward named this species *Stauroneis Terryi*. In another small stream on Fall Mountain, Mr. W. C. Richards found a colony of *Navicula elliptica* Kütz., notable for abundance and size of individuals.

In five different ponds in Bristol I have found an abundance of a new *Surirella*, and in one of these ponds it is the predominating form. It is about the size of *S. gracilis* A. Schm., but not so alate, and with rounded ends, costa distinct, reaching the median line, which is strongly marked; most specimens have a slight spiral twist. It occurs in two types, one greatly elongated. The living frustules are sometimes covered with coarse granulations that do not come off in the acid treatment, but are removed by the soda. Prof. H. L. Smith wrote me "This *Surirella* is certainly new and much more deserving of a specific name than many others." Dr. Ward named it *Surirella Terryi*. I have found this species abundant in one small pond in New Britain and in one at Leete's Island, but in all other localities known to me it is extremely rare. In Birge's Pond in Bristol are countless numbers of a very peculiar abnormal form of *Surirella*. It is a double frustule in which the two inner valves are grown together with a perforation through the center where the protoplasm of the two cells joins. This opening is sometimes a mere raphe or cleft, more often it is a long narrow slit with smooth edges, but generally it is a large irregular orifice with corrugated sides. This peculiarity is most abundant in *Surirella elegans* Ehrenb., but frequent in *S. cardinalis* Kitton, and occasional, in *S. splendida* (Ehrenb.) Kütz. I found it first in *S. striatula* Turpin in an artificial culture of material from West River, New Haven. Mr. Richards brought me mud from a pond in Wallingford, in which I found it abundant in *S. saxonica* Auersw.; I have seen it in *S. tenera* Greg. and *S. fastuosa* Ehrenb., and have found it in Plymouth and in Derby. An illustrated description was published in Tempère's Micrographe Préparateur.[1]

Nearly every marsh with a level surface covers a deposit of diatoms, and the salt marshes of the Connecticut shore are no exceptions. All of these that I have examined lie above a marine deposit, which generally appears like clay, but always contains diatoms and is sometimes quite rich. The ancient channel of Leete's Island from Great Harbor on the south around to Shell Beach on the north, is one immense mass of marine deposit, in some places fifty feet thick. When the railroad crossing it was changed from a trestle to an embankment, the pressure of the great bank of earth forced out the marine mud

[1] W. A. Terry, Sur un étrange mode de développement chez le genre Surirella. Le Micrographe Préparateur, Vol. XIII, p. 57, 1905.

below it which rose up in great banks on each side of the railroad. All this material contained diatoms, and some of it was very rich, especially in number and rarity of species. I dug up material from about twelve feet below the surface, and found a stratum rich in the beautiful *Surirella Febigerii* Lewis and other rare kinds. One pound of this earth furnished diatoms enough to make several thousand slides, each slide containing thousands of diatoms. The marine deposit in these marshes is sometimes near the surface, and is thrown out in digging ditches, and always in quantities in preparing the foundations for the abutments of bridges. From the earth thrown out in digging a post-hole for a fence on the margin of the marsh near Branford Station I procured a supply of *Campylodiscus echineis* Ehrenb. The Quinnipiac marshes are large, and along their western margin is a series of clay pits from which the tide water is kept out by dikes. The diatomaceous deposit here is of no great thickness but has a very interesting collection of species. At Davis pit the clay is covered by a layer of sand, upon which rests a stratum of alluvium, which contains fresh water diatoms exclusively; these are mostly decayed and broken, those entire being chiefly *Navicula lata* Bréb., with a few of the large *Stauroneis acuta* and *Navicula Semen* Ehrenb. Upon the alluvium is a mass of loam containing the roots and stumps of trees with their trunks and branches beside them, the whole covered with the marine deposit, which extends upward through about four feet of coarse peat.

At many places along the Connecticut shore the ancient marine deposit projects through the bank of sand forming the beach, and is visible at low tide, the huge bank of sand being a superficial structure cast up by the sea and resting upon the ancient deposit. All these salt marshes were once open water, and the sea is now coming back upon them and swallowing up the land. Some of the pond holes in these marshes are deep, with a bottom of soft mud; these are often the remains of former open water, and are always rich in diatoms, frequently very different from those of the neighboring waters. Here is the home of the large *Pleurosigma balticum*, the very large *Amphiprora pulchra* Bail., the larger type of *Surirella striatula*, *Scoliopleura*, *Amphora*, and a variety of rare forms.

In a pond hole of the marshes of Morris Creek I found a new *Pleurosigma*, quite large, in Morris Creek another, not quite so large. On the rocks near the tide gate were masses of *Melosira Borreri* Grev.,

looking in the water like enormous sponges, but collapsing when gathered into a rope of harsh feeling filament, about two feet long, which held great numbers of other diatoms, among them another new *Pleurosigma*, quite small. I sent all three to Tempère, he passed them on to Peragallo, who published illustrated descriptions of them in his monograph [1] which is now the accepted standard for *Pleurosigma*. Peragallo named the largest one *P. Terryanum*, the second *P. Americanum*, and the third *P. paradoxum*. He describes the first as having the outline of *P. strigilis* W. Sm., but the striation of *P. balticum*; the second having the outline of *P. elongatum* W. Sm., but striation of *P. decorum* W. Sm.; and the third was named *P. paradoxum* because the least approximate of its series of striae was the most difficult to resolve. I afterwards found *P. Terryanum* more abundant and larger in a broad ditch at Quinnipiac, and in a pond at Leete's Island. Its natural habitat is in brackish water fed by fresh water springs and too nearly fresh to support *P. balticum*. With this is often found *P. elongatum*, and also the robust type of *Surirella striatula* and a peculiar variety of *Navicula permagna* (Bail.) Ehrenb. The normal type of *N. permagna* is abundant in Oyster River, Woodmont. The species of *Pleurosigma* are found with it at Leete's Island, and also a remarkable colony of *Navicula maculata* Bail., which occurs here in great abundance, and in three distinct types; the largest is extremely rare elsewhere, the second found occasionally along the Connecticut shore, and the third and smallest is the most common. I have it from the New Jersey shore and from Cuxhaven, North Sea. A much smaller variety but with coarser puncta is found in Alabama. The typical *P. Terryanum* is the largest *Pleurosigma* that I find in Connecticut; *P. Americanum* is abundant in tidal creeks; in the marsh on the West Haven side of West River, on the muddy sloping bank of a ditch, I have seen at low tide a brown film about two feet wide and a hundred feet long, which consisted almost entirely of living frustules of *P. Americanum*. *P. paradoxum* is most abundant in Morris Creek, occasional elsewhere. Morris Creek is also the habitat of *Actinocyclus Barkleyi* (Ehrenb.) Grun., which is living here in abundance. I have it also in considerable numbers from the Thames river above Norwich in material sent me by Mr. G. R. Lumsden of Greenville.

[1] Peragallo, Monographie du genre Pleurosigma., Le Diatomiste, Vol. I.

At Branford I find *Ditylum Brightwellii* (West) Grun.; the drawings in books show this with long central spine with abrupt termination, without finish; the Branford specimens have a longer spine terminating in a knob or ball, which indicates that the specimens from which the figures were made were broken. *Nitzschia scalaris* (Ehrenb.) W. Sm. grows abundantly in the brackish water of many of the pond holes of the salt marshes. Pond's Point at Milford is a rounded projection where the southward trend of the shore changes abruptly to west. The beach is composed of large cobblestones and boulders upon a coarse gravel. On its southern margin is visible at low tide a bank of fossil mud, which is firm enough to resist the action of the waves, and is being gradually uncovered as the mass of stones is driven back by storms. A stratum near the upper part of this bank is very rich in diatoms, showing an unusual combination of marine and brackish water forms of more than one hundred species. *Coscinodiscus, Actinoptychus, Triceratium, Amphitetras, Eupodiscus,* with a dozen species of *Pleurosigma* occur, while the abundance of the brackish water form of *Surirella striatula* and *Navicula permagna,* with *Scoliopleura, Amphora, Amphiprora* and *Nitzschia scalaris* (Ehrenb.) W. Sm. show this mud to have once formed the bottom of a pond hole in the marsh; the fresh water spring that fed it still flows over it, and can be seen at low tide. The pressure of the great bank of stones which rested upon it during the time it was being driven over by the sea has crushed to fragments most of the delicate species, but enough remain to show conclusively its character. The marine species mentioned above can be found generally in deep water all along the Connecticut shore, while the different varieties of *Navicula lyra* Ehrenb. and the *Pleurosigmas* are most abundant in shallow water. I have *P. intermedium* W. Sm. abundant in the deep water of Clinton, and the very rare *Navicula Lewisiana* Grev. in shallow water at Bridgeport. *P. balticum* is the most abundant species of the genus, and has many varieties, the largest being found in the salt marshes, the normal type in coves and bays, and the smallest in deep water. *P. affine* Grun. is the most universally distributed being found everywhere along the shore but not generally in great abundance. It is very often mistaken for *P. angulatum* W. Sm., although striation is very different. *P. angulatum* is frequent but local. A ditch in the Quinnipiac marshes through which flows at low tide a strong stream of nearly fresh water is carpeted with a dense growth of *Biddulphia levis* Ehrenb., and near

this is a colony of large and very active *Bacillaria paradoxa* (Gmel.) Grun. Another colony of this species in Morris Creek marsh, although in constant motion, was covered with a parasitic growth of *Leptothrix*, and was accompanied by numerous rapidly revolving filaments of *Spirulina*.

In fresh water the most abundant genus is *Pinnularia* W. Sm.; it is found in quantities almost everywhere. Next to this in numbers is the genus *Stauroneis*, then *Cymbella*, *Surirella*, *Navicula*, and numerous filamentous forms. Although these genera are represented in nearly every pond, yet each pond shows a combination characteristic of itself, and types of the same species vary greatly in the different ponds. In several ponds in Bristol *Surirella elegans* is very large and sometimes much elongated; in Plymouth it is smaller and much shorter in proportion; in Highland Lake, Winsted, beautifully typical specimens of *S. nobilis* W. Sm. are abundant, and in several ponds in Connecticut *Navicula peripunctata* Brun abounds; Prof. Brun founded the species on specimens in mud from Crane Pond, Groveland, Massachusetts, but it is more plentiful in Bristol and in Leete's Island. Van Heurck states that *Achnanthidium flexellum* (Kütz.) Bréb. is rare; it is abundant in two of the Bristol fossil deposits. He also gives *Fragilaria Harrisonii* Grun as very rare; this grows abundantly in Bristol. Dr. Ward found a new diatom in one of my slides from the Connecticut shore, which Cleve named *Caloneis Wardii*. Mr. O. E. Shaffer sent a find of *Nitzschia* to Europe from Port Townsend, Puget Sound, and Cleve named this *N. Shafferi*; I had previously found this nearly twenty years ago at Morris Creek, and reported it at the time in the Amer. Micr. Journal as *N. curvula*. I find *Isthmia nervosa* Kütz. in nearly every deep water sounding from off the Connecticut shore, but do not believe that it grows here; it is probably brought in by ocean currents from warmer waters.

List of Species.

The arrangement of this list is that of De Toni, Sylloge Algarum, and the nomenclature for the most part follows that work. Names given as synonyms are those that have been used by the writer either in published notes or with material distributed. Species marked with a star were founded on Connecticut material.

Navicula nobilis (Ehrenb.) Kütz. Common.

Navicula var. *dactylus* (Ehrenb.) VH. (*N. dactylus* Kütz.) Abundant everywhere.
" *gigas* (Ehrenb.) Kütz. Common.
" *major* Kütz. Abundant everywhere.
" *viridis* (Nitzsch) Kütz. Abundant everywhere.
" *cardinalis* Ehrenb. Frequent, local, Bristol.
" *yarrensis* Grun. Occasional.
" *divergens* (W. Sm.) Ralfs. Frequent, local, Bristol.
" *longa* (Greg.) Ralfs. Frequent.
" *lata* Bréb. Frequent.
" *borealis* (Ehrenb.) Kütz. Frequent, local, Bristol.
" *directa* Ralfs. Occasional.
" *Brebissonii* Kütz. Frequent, local, Bristol.
" *Tabellaria* Kütz. Frequent, local.
" *gibba* (Ehrenb.) Kütz. Frequent, local, Bristol.
" *Legumen* Ehrenb. Occasional.
" *polyonca* Bréb. Frequent.
" *peregrina* (Ehrenb.) Kütz. Common.
" *semen* Ehrenb. Frequent, local, Bristol.
" *zostereti* Grun. Rare, Morris Creek.
" *rhyncocephala* Kütz. Occasional.
" *cancellata* Donk. Frequent, local, Fort Hale.
" *fortis* (Greg.) Grun. Occasional.
" *digito-radiata* (Greg.) Ralfs. Occasional.
" *distans* (W. Sm.) Ralfs. Occasional.
" *brasiliensis* Grun. Frequent.
" *crabro* (Ehrenb.) Kütz. Frequent.
" *interrupta* (Bail.) Kütz. Frequent.
" *didyma* Ehrenb. Common.
" *bombus* (Ehrenb.) Kütz. Occasional.
" *Smithii* Bréb. Frequent.
" *fusca* (Greg.) Ralfs. Frequent.
" *advena* A. Schm. Occasional.
" *elliptica* Kütz. Occasional.
" " var. *oblongella* (Näg.) VH. (*N. oblongella* Näg.) Occasional.
" *lyra* Ehrenb. Locally abundant.
" *pygmaea* Kütz. Local.
" *forcipata* Grev. Occasional, New Haven Harbor.
" *caribaea* Cleve. Occasional, New Haven Harbor.
" *approximata* Grev. Occasional, New Haven Harbor.
" *irrorata* Grev. Occasional.
" *praetexta* Ehrenb. Occasional.
" *Hennedyi* W. Sm. Occasional, Leete's Island.
" *clavata* Greg. Occasional.
" *polysticta* Grev. Occasional, New Haven Harbor.
" *hibernica* O'M. Occasional.

Navicula aspera Ehrenb. Occasional.
" *californica* var. *campeachiana* Grun. Occasional.
" *circumsecta* Grun. Occasional.
" *tuscula* Ehrenb. Rare, local, Bristol.
" *crucicola* (W. Sm.) Donk. Local.
" *palpebralis* Bréb. Occasional.
" *Fischeri* A. Schm. Occasional.
" *arabica* Grun. Occasional.
" *humerosa* Bréb. Frequent.
" *tumescens* Grun. Common.
" *marina* Ralfs. Occasional.
" *pusilla* W. Sm. Local, Quinnipiac.
" *latissima* Greg. Rare.
" *kamorthensis* Grun. Rare, Stony Creek.
" *cuspidata* Kütz. Frequent, local, Bristol.
" *sphaerophora* Kütz. Rare, local, Bristol.
" *serians* (Bréb.) Kütz. Frequent, local, Bristol.
" *formosa* Greg. Frequent.
" *permagna* (Bail.) Edw. Occasional; abundant at Woodmont.
" *elegans* W. Sm. Occasional.
" *limosa* Kütz. Occasional.
" *iridis* Ehrenb. Common.
" " var. *Amphigomphus* (Ehrenb.) VH. (*N. amphigomphus* Ehrenb.) Local.
" " var. *producta* (W. Sm.) VH. (*N. producta* W. Sm.) Occasional.
" " var. *amphirhynchus* (Ehrenb.) De Toni. (*N. amphirhynchus* Ehrenb.) Local.
" *firma* Kütz. Common.
" *Hitchcockii* Ehrenb. Rare, local, Bristol.
" *liber* W. Sm. Occasional.
" *americana* Ehrenb. Rare, local, Bristol.
" *bacillum* Ehrenb. Local.
" *Powellii* Lewis. Occasional.
" *columnaris* Ehrenb. Common.
" *esox* (Ehrenb.) Kütz. Occasional.
" *Sillimanorum* (Ehrenb.) Kütz. Rare, local, Bristol.
" **parallela* Castr. Rare, Bristol.
" *dilatata* Ehrenb. Common.
" *delawarensis* Grun. Local, Quinnipiac.
" *interposita* Lewis. Frequent.
" *amphipleuroides* Grun. Rare.
" *Bartleyana* Grun. Occasional.
" *diploneis* var. *obliquus* Brun. Occasional.
" *maculata* Bail. Occasional; abundant at Leete's Island.
" *peripunctata* Brun. Occasional; abundant in Bristol.

Navicula **theta* Cleve. Local, Quinnipiac.
" **tubulosa* Brun. Occasional.
Caloneis **Wardii* Cleve. Occasional.
Diploneis **didyma* var. *obliqua* Brun. Occasional.
Libellus rhombicus (Greg.) De Toni. (*Navicula rhombica* Greg.)
Rhoiconeis trinodis (W. Sm.) Grev. (*Navicula trinodis* W. Sm.) Rare, Bristol.
Stauroneis phoenicenteron (Nitzsch) Ehrenb. Abundant everywhere.
" *gracilis* W. Sm. Frequent.
" *Gregoryi* Ralfs. Occasional.
" *spicula* Hickie. Rare, Quinnipiac.
" *salina* W. Sm. Common along shore.
" *Stodderi* Lewis. Rare, Bristol.
" **nova britannica* Terry. Rare; only in New Britain.
" **Terryi* Ward. Exceedingly rare; only in Bristol.
Pleurostauron acutum (W. Sm.) Ralfs. (*Stauroneis acuta* W. Sm.) Common.
Pleurosigma angulatum (Quek.) W. Sm. Frequent, local.
" " var. *aestuarii* (Bréb.) VH. Occasional.
" *elongatum* W. Sm. Frequent.
" " var. *gracile* Grun. Occasional.
" *strigosum* W. Sm. Rare, Clinton.
" *naviculaceum* Bréb. Rare.
" *intermedium* W. Sm. Rare, Clinton.
" *nubecula* W. Sm. Rare, Clinton,
" *latum* Cleve. Rare.
" *formosum* W. Sm. Occasional.
" *hypocampus* W. Sm. Frequent, local.
" *decorum* W. Sm. Locally abundant.
" *littorale* W. Sm. Rather rare.
" *balticum* (Ehrenb.) W. Sm. Frequent, local.
" *simile* Grun. Rare, Leete's Island.
" *attenuatum* W. Sm. Frequent, local.
" *Wansbeckii* Donk. Frequent.
" *acuminatum* (Kütz.) Grun. Rather rare.
" *strigile* W. Sm. Occasional.
" *affine* Grun. & Cleve. Common all along the shore.
" **paradoxum* Per. Occasional, Morris Creek.
" *Brebissonii* Grun. & Cleve. Frequent.
" **Terryanum* Per. Local, Quinnipiac, Leete's Island.
" *Spencerii* (Quek.) W. Sm. Frequent, local.
" " var. *curvulum* (Kütz.) Grun. Rare, Quinnipiac.
" *fasciola* W. Sm. Frequent.
" *scalproides* Rab. Rare.
" *eximium* (Thw.) Grun. & Cleve. Occasional.
" **americanum* Per. Abundant, Morris Creek, New Haven.

Pleurosigma subsalinum Per. Rare, Leete's Island, Milford.
Gyrosigma **Temperii* Cleve. Occasional.
Scoliopleura latestriata (Bréb.) Grun. Frequent.
" " *var. *Amphora* Cleve. Rare, Morris Creek.
" *tumida* (Bréb.) Rab. Frequent.
Frustulia rhomboides (Ehrenb.) De Toni. (*Navicula rhomboides* Ehrenb. Frequent.
" " var. *saxonica* (Rab.) De Toni. (*Navicula crassinervia* Bréb.) Occasional.
" *Lewisiana* (Grev.) De Toni. (*Navicula Lewisiana* Grev.) Rare, Bridgeport only.
" *viridula* (Bréb.) De Toni. (*Schizonema viridulum* Rab.) Rare.
Dickiea crucigera (W. Sm.) De Toni. (*Schizonema crucigerum* W. Sm.) Rare, Quinnipiac.
Brebissonia Boeckii (Kütz.)Grun. (*Navicula Boeckii* Bréb.) Occasional; abundant in Thames River.
Mastogloia **gibbosa* Brun. Occasional.
" *undulata* Grun. Occasional.
Amphiprora lepidoptera Greg. Frequent.
" " var. *pusilla* (Greg.) VH. Frequent.
" *maxima* Greg. Locally abundant.
" *alata* Kütz. Frequent.
" *pulchra* Bail. Locally abundant.
" *conspicua* Grev. Frequent.
" *ornata* Bail. Frequent.
Plagiotropis vitrea (W. Sm.) Grun. (*Amphiprora vitrea* W. Sm.) Frequent.
Tropidoneis **seriata* Cleve. Occasional.
" **zebra* Cleve. Occasional.
Cymbella Ehrenbergii Kütz. Locally abundant.
" *cuspidata* Kütz. Frequent.
" *affinis* Kütz. Local, New Britain.
" *heteropleura* (Ehrenb.) Kütz. Local.
" *gastroides* Kütz. Common everywhere.
" *cymbiformis* var. *parva* (W. Sm.)VH. Local, New Britain.
" *americana* A. Schm. Locally abundant.
" *cistula* var. *maculata* (Kütz.) Grun. Local, New Britain.
Encyonema caespitosum Kütz. Frequent.
" *prostratum* (Bail.) Ralfs. Frequent.
Amphora levis Greg. Frequent.
" *cingulata* Cleve. Frequent.
" *erebi* Ehrenb. (*A. cymbifera* Greg.) Frequent.
" *Clevei* A. Schm. Frequent.
" *intersecta* A. Schm. Frequent.
" *Eulensteinii* Grun. Frequent; locally abundant at Milford.
" *proteus* Greg. Frequent.

Amphora obtusa Greg. Frequent.
" *ovalis* (Bréb.) Kütz. Frequent.
Gomphonema acuminatum Ehrenb. Common.
" *constrictum* Ehrenb. Common.
" *capitatum* Ehrenb. Common.
" *geminatum* (Lyng.) Ehrenb. Common.
" *augur* Ehrenb. (*G. cristatum* Ralfs.) Common.
Rhoicosphaenia curvata (Kütz.) Grun.
Cocconeis scutellum Ehrenb. Frequent.
" *dirupta* Greg. Frequent.
Achnanthes longipes Ag. Common.
" *brevipes* Ag. Common.
" *subsessilis* Kütz. Fort Hale.
" **curvirostrum* Brun. Very rare, Morris Cove.
" **manifera* Brun. Very rare, Morris Cove.
Achnanthidium flexellum (Kütz.) Bréb. Rare; abundant in Bristol, fossil.
Bacillaria paradoxa (Gmel.) Grev. Occasional near New Haven.
Nitzschia granulata Grun. Occasional.
" *tryblionella* Hantzsch. Frequent.
" " var. *maxima* Grun. Occasional.
" *plana* W. Sm., Occasional.
" *marginulata* Grun. Occasional.
" *acuminata* (W. Sm.) Grun. Occasional.
" *circumsuta* (Bail.) Grun. Frequent.
" *scalaris* (Ehrenb.) W. Sm. Abundant.
" *angularis* W. Sm. Frequent.
" *sigmoidea* (Nitzsch) W. Sm. Frequent, locally abundant.
" *sigma* (Kütz.) W. Sm. Common.
" *fasciculata* Grun. Common.
" *obtusa* W. Sm. Occasional.
" *linearis* var. *tenuis* (W. Sm.) Grun. (*N. tenuis* W. Sm.) Rare, Leete's Island.
" *curvirostris* var. *Closterium* (Ehrenb.) VH. (*N. Closterium* W. Sm.) Rare, West Haven.
" *Lorenziana* Grun. Rare.
" *Shafferi* Cleve. (*N. curvula* Terry, not W. Sm.) Very rare, Morris Cove.
Hantzschia amphioxys (Ehrenb.) Grun. Abundant in Bristol.
" **segmentalis* Brun. Rare, Morris Cove.
Surirella biseriata (Ehrenb.) Bréb. Common.
" *linearis* W. Sm. Frequent.
" *robusta* Ehrenb. Frequent in Winsted.
" *splendida* (Ehrenb.) Kütz. Common.
" *tenera* Greg. Common.
" *elegans* Ehrenb. Common.
" " var. *norvegica* (Eulen.) Brun. Occasional, Bristol.

Surirella striatula Turp. Frequent, locally abundant.
" " var. *triplicata* Grun. Occasional.
" *gemma* Ehrenb. Frequent.
" *cardinalis* Kitt. Rather rare; abundant in Bristol.
" *ovalis* Bréb. Occasional.
" " var. *angusta* (Kütz.) VH. (*S. angusta* Kütz.) Occasional.
" *fastuosa* Ehrenb. Frequent.
" " var. *lata* (W. Sm.) VH. Frequent.
" *recedens* A. Schm. Occasional.
" *Moelleriana* Grun. Occasional.
" *gracilis* A. Schm. Occasional.
" *Febigerii* Lewis. Frequent.
" *constricta* Ehrenb. Rare, Killingsworth.
" **Terryi* Ward. Rare, except in Bristol, New Britain and Leete's Island.
Cymatopleura elliptica (Bréb.) W. Sm. Rare, New Britain.
" *solea* (Bréb.) W. Sm. Occasional.
" *hibernica* W. Sm. Rare.
" *marina* Lewis. Rare, Clinton.
Podocystis adriatica Kütz. (*P. americana* Bail.) Rare.
Campylodiscus echineis Ehrenb. Common.
" *hibernicus* Ehrenb. Frequent.
Diatoma vulgare Bory. Frequent.
" *elongatum* var. *tenue* (Ag.) VH. (*D. tenue* Ag.) Frequent.
" *hiemale* (Lyngb.) Heib. (*Odontidium hiemale* Kütz.) Locally abundant.
" *anceps* (Ehrenb.) Kirchn. Frequent.
Odontidium mutabile W. Sm. Locally abundant.
" *Harrisonii* W. Sm. (*Fragilaria Harrisonii* Grun.) Rare and local, Bristol.
Meridion circulare (Grev.) Ag. Frequent.
" *intermedium* H. L. Sm. Frequent.
Synedra pulchella (Ralfs) Kütz. Occasional.
" " var. *Smithii* (Ralfs) VH. Occasional.
" *ulna* var. *danica* (Kütz.) VH. (*S. danica* Kütz.) Frequent.
" *affinis* Kütz. Frequent.
Ardissonia superba (Kütz.) Grun. (*Synedra superba* Kütz.) Occasional, Leete's Island.
Asterionella formosa Hass. Abundant in water supply.
" *Ralfsii* W. Sm. Abundant in water supply.
Fragilaria virescens Ralfs. Common.
" *capucina* Desmaz. Common.
" *construens* (Ehrenb.) Grun. Common.
Raphoneis amphiceros Ehrenb. Frequent.
" *belgica* Grun. Rare, Leete's Island.
" " var. *intermedia* Grun. Occasional.
" *gemmifera* Ehrenb. Frequent.

Dimerogramma minus (Greg.) Ralfs.
" *Surirella* (Ehrenb.) Grun. (*Raphoneis Surirella* Grev.) Occasional.
Plagiogramma staurophorum (Greg.) Heib. (*P. Gregorianum* Grev.) Occasional, Quinnipiac.
" *validum* Grev. Occasional, Leete's Island.
Licmophora flabellata (Carm.) Ag. Frequent.
" *Juergensii* Ag. Frequent.
" *tincta* (Ag.) Grun. Frequent.
Tabellaria fenestrata (Lyngb.) Kütz. Common.
" *flocculosa* (Roth) Kütz. Common.
Grammatophora oceanica var. *macilenta* (W. Sm.) Grun.
Rhabdonema arcuatum (Lyngb.) Kütz. Occasional.
" *adriaticum* Kütz. Common.
Epithemia turgida (Ehrenb.) Kütz. Frequent.
" *gibba* (Ehrenb.) Kütz. Occasional.
" " var. *ventricosa* (Ehrenb.) Grun. Frequent.
" *argus* (Ehrenb.) Kütz. Frequent.
" *zebra* (Ehrenb.) Kütz. Frequent.
" *musculus* Kütz. Frequent.
Eunotia major (W. Sm.) Rab. Frequent.
" *praerupta* Ehrenb. Frequent.
" " var. *bidens* Grun. Frequent.
" *gracilis* (Ehrenb.) Rab. Frequent.
" *robusta* Ralfs, including *E. Diadema* Ralfs. Frequent.
" *elongata* Rab. Frequent.
Pseudoeunotia lunaris (Ehrenb.) Grun. (*Eunotia lunaris* Grun.) Locally abundant.
" *flexuosa* (Bréb.) Grun. (*Eunotia flexuosa* Bréb.) Locally abundant.
" *flexuosa* var. *bicapitata* Grun. Locally abundant.
Actinella punctata Lewis. Common.
Rhizosolenia styliformis Brightw. Leete's Island.
Isthmia nervosa Kütz. Frequent.
Hemiaulus affinis Grun. South Haven.
" *tubulosus* Brun. Occasional.
Odontella aurita (Lyng.) Ag. (*Biddulphia aurita* Bréb.) Frequent.
" *turgida* (W. Sm.) VH. Frequent.
Biddulphia pulchella Gray. Frequent.
" *Tuomeyi* (Bail.) Roper. Occasional.
Denticella mobiliensis (Bail.) Grev. (*Biddulphia Baileyi* W. Sm.) Rare.
" *rhombus* Ehrenb. (*Biddulphia rhombus* W. Sm.) Frequent.
Eunotogramma laeve Grun. Occasional.
Terpsinoe musica Ehrenb. Occasional.
" *americana* (Bail.) Ralfs. Occasional.

Amphitetras antediluvianus Ehrenb. Frequent.
Triceratium alternans Bail. Occasional.
" *flavum* Ehrenb. Frequent.
Lithodesmium undulatum Ehrenb. Leete's Island.
Syndendrium diadema Ehrenb. Occasional.
Periptera tetracladia Ehrenb. Occasional.
Pyxilla baltica Grun. Frequent; locally abundant, Leete's Island.
Ditylium Brightwellii (West) Grun. including *D. inaequale* Bail., *D. tetragonum* Bail., and *D. trigonum* Bail. Very rare, Branford only.
" *intricatum* (West) Grun. Very rare, Branford.
Auliscus pruinosus Bail. Frequent.
" *sculptus* (W. Sm.) Ralfs. Common.
" *caelatus* Bail. Occasional.
" *Macraëanus* Grev. Occasional.
Pseudoauliscus radiatus (Bail.) Rattray. Rare, Leete's Island.
Cerataulus levis (Ehrenb.) Ralfs. (*C. polymorphus* VH. *Biddulphia levis* Ehrenb.) Frequent.
Eupodiscus Rodgersii Ehrenb. Rare, Leete's Island.
" *argus* Ehrenb. Frequent.
Stephanopyxis turris (Grev.) Ralfs. Occasional, New Haven.
" " var. *intermedia* Grun. (*S. appendiculata* var. *intermedia* Grun.) Occasional.
" *ferox* (Grev.) Ralfs. Occasional, Milford.
" *corona* (Ehrenb.) Grun. Occasional.
Stephanodiscus niagarae Ehrenb. Rare.
Actinocyclus crassus VH. Frequent.
" *Ralfsii* (W. Sm.) Ralfs. Frequent.
" *Barkleyi* (Ehrenb.) Grun. Abundant, Morris Cove.
" *Ehrenbergii* Ralfs. Frequent.
" *tenuissimus* Cleve. Rare, Morris Cove.
" *subtilis* (Greg.) Ralfs. Rare, Morris Cove.
" *triradiatus* Roper. Rare, Leete's Island.
Coscinodiscus excentricus Ehrenb. Frequent.
" *nitidus* Greg. Frequent.
" *symbolophorus* Grun. Occasional.
" *subtilis* Ehrenb. Rare, local.
" *marginatus* Ehrenb. Occasional.
" *radiatus* Ehrenb. Frequent.
" *concinnus* W. Sm. Frequent.
" *gigas* Ehrenb. Rare, Leete's Island.
" *asteromphalus* Ehrenb. Frequent.
" *oculus-iridis* Ehrenb. Frequent.
" *apiculatus* Ehrenb. Frequent.
Lysigonium moniliforme (Mull.) Link. (*Melosira Borreri* Grev.) Locally abundant.
" *varians* (Ag.) De Toni. (*Melosira varians* Ag.) Abundant.

Gallionella nummuloides (Dillw.) Bory. (*Melosira nummuloides* Ag.) Frequent.
Melosira undulata (Ehrenb.) Kütz. Frequent.
" *sculpta* (Ehrenb.) Kütz. Common.
" *coronata* Grun. New Haven.
" *octogona* Grun. Frequent.
Paralia sulcata (Ehrenb.) Cleve. Rare, Leete's Island.
Cyclotella antiqua W. Sm. Very rare, Bristol only.
" *striata* (Kütz.) Grun. Silver Sands.
" *Kuetzingiana* Thw. Frequent.
Podosira dubia (Kütz.) Grun. Occasional.
Hyalodiscus subtilis Bail. Occasional.
" *stelliger* Bail. Occasional.
Actinoptychus undulatus (Bail.) Ralfs. Common.
" *velatus* Ehrenb. Occasional.

Bristol, Connecticut.

THE GENUS SUAEDA IN NORTHEASTERN AMERICA.

M. L. Fernald.

The genus *Suaeda* has long been for the American botanist a source of much confusion and difficulty, in part because it consists of unattractive plants of saline soils which are generally ignored by collectors, in part because of the very indefinite conception of the true *Suaeda maritima* of Europe — the species about which our studies, at least of the eastern coast forms, must largely center. It has long been known to many New England botanists that we have on our northeastern coast more than the single species alloted to this region in Gray's Manual; and the two species described and figured (as *Dondia*) in Britton & Brown's Illustrated Flora satisfactorily cover only the forms which occur on the salt marshes and sea beaches from southern New England southward. On the coast of Maine are other forms which in habit, flowering-season, and fruit-characters are unlike the plants of the more southern shores.

During the summer of 1898 Mr. J. C. Parlin and the writer spent a day (July 23) upon Wells Beach and the adjacent marshes in southern Maine. At that time a small depressed *Suaeda* (no. 1) with short subcylindric dark green leaves was in mature fruit. Another depressed

and very slender plant (no. 2) with longer semicylindric very glaucous foliage was in flower and with occasional mature seeds. A third but scarce plant (no. 3), then beginning to fruit, had much coarser purple-tinged ascending and slightly branching stems, and the leaves only slightly glaucous. Two other species not then in flower were common — one an erect or ascending profusely branched green plant (no. 4) a foot or two high, the elongate-linear leaves not glaucous; the other a depressed plant (no. 5), at that time showing no trace of flowering, generally with the coarse stems and slender leaves purplish. Late in the following September additional collections and field notes were made about Wells Beach by Miss Kate Furbish. The two slender depressed plants (nos. 1 & 2) which had been in fruit nearly two months earlier were, at the time of these later observations, over-ripe or quite shrivelled, and the tall erect very branching plant (no. 4) was in mature condition, but the coarse decumbent plant (no. 5) with its green or generally claret-colored stems and leaves was barely in fruit. Its habit, however, and the very dense elongate-spicate inflorescences distinguished it superficially from the other plants near which it grew. An exhaustive study of the Suaedas of eastern Massachusetts recently made by Mr. Wm. P. Rich has shown that two forms — the tall late-fruiting species (no. 4) and the ascending plant (no. 3) noted as scarce on Wells Beach — are generally distributed along the Massachusetts coast, while a third plant, the slender depressed very glaucous form (no. 2) occurs on the North Shore.

A detailed examination of these five plants shows that besides their marked habital characters and their different fruiting seasons, at least four of them possess good differential characters in their calyces and seeds. These five New England plants divide themselves naturally into two groups — the first, with the sepals thickened and strongly carinate upon the back, including the two late-flowering plants (nos. 4 & 5); the second group, with the sepals thinner and rounded or very slightly carinate upon the back, including the three plants (nos. 1, 2, and 3) found fruiting in late July. The former group includes the plants now generally passing as *Suaeda linearis* (Ell.) Moq. (*Dondia Americana* Britton in part); and the three plants with the sepals more rounded on the back are included under *Suaeda maritima* (L.) Dum. (*Dondia maritima* Druce).

In order to make a satisfactory disposition of these forms it is necessary first to gain a clear conception of the European *Suaeda*

maritima. This unfortunately is not easily accomplished. The specimens distributed as this species from European herbaria are very different from one another, and, like the American plant, they are probably a confusion of several distinct things. The descriptions too are confusing. When one refers, however, to the original description of the Linnaean *Chenopodium maritimum*, upon which *Suaeda maritima* was founded he finds an indication that the name belongs to the plant which of late has been so called in America. At least, judging from an excellent photograph secured by Dr. B. L. Robinson of the specimen preserved at the British Museum, the plant first cited by Linnaeus (the Hortus Cliffortianus specimen) is our bushy-branched plant with large calyces and the achenes 2 mm. broad. The maturer specimens in the Linnaean Herbarium, as photographed by Dr. Robinson, seem also to be like the plant of Hortus Cliffortianus. This species is fortunately the plant represented in the plates cited by Moquin in his description of *Chenopodina maritima α vulgaris* in DeCandolle's Prodromus. These plates are two [1] and they represent a plant well known in our herbaria both from Europe and America. In habit, color, calyx and seed it is closely matched by the third form mentioned from Wells Beach, and found very generally on the Atlantic coast of America.

Our conception of *Suaeda linearis* (Ell.) Moq. has also been very confused. From his description Elliott's *Salsola linearis* is apparently a tall erect freely branching plant (no. 4) which is common on the Atlantic coast from southern Maine to Texas. Elliott cited, however, as synonyms two plants — *Salsola salsa*? Michaux and *Chenopodium maritimum* Walter — neither of which seems clearly identified with the "nearly erect....much branched" plant which he described. The erect bushy plant with the flowers "spiked" and with the sepals "angled on the back," as described by Elliott, has small seeds, rarely 1.5 mm. broad. The portion of Walter's specimen of *Chenopodium maritimum* preserved in the Gray Herbarium shows a plant apparently not distinguishable from the common *Suaeda maritima* of Europe and our northeastern coast. The fragment has the large flowers subtended by leaves which are much longer than in the commoner tall southern plant with its "spiked" flowers, the larger sepals are not distinctly carinate, and the large seed (2 mm. broad) is not different

[1] Oeder, Fl. Dan. iii. t. 489 (1770); Sm. Engl. Bot. t. 633 (1799).

from that of the European *Chenopodium maritimum*. Moquin in his monograph of the *Chenopodiaceae* transferred the tall plant to *Suaeda*, as *S. linearis*, following very closely Elliott's description. In DeCandolle's Prodromus, however, he states that the seeds are a line long,— the size of those in Walter's plant and in the common *S. maritima*, but much larger than in the common southern plant which closely matches Elliott's and Moquin's original descriptions. This large-seeded plant, with the leaves of the flowering branches usually elongated and with thin rounded sepals was accepted by Dr. Watson in his early studies of the group as true *Suaeda linearis* Moq. (*Salsola linearis* Ell.), and the small-seeded plant with carinate sepals, described by Elliott was treated as a variety of the species, var. *ramosa*, though later, in the 6th edition of Gray's Manual, he considered the common erect plant with small seed true *S. linearis*.

Under his *Suaeda linearis*, var. *ramosa*, Dr. Watson apparently without hesitation included as a synonym *Salsola salsa* Michaux, from the mouth of the St. Lawrence, a plant which had been included with hesitation by Moquin and others under *Suaeda linearis*. From the original Michaux material it is impossible to determine with certainty the exact identity of that plant; but that it is the same as the erect branching small-seeded *Suaeda linearis* (var. *ramosa* Wats.) of the southern coast is open to serious doubt. So far as exploration on the Maine coast and the lower St. Lawrence has shown, the tall small-seeded *S. linearis* rarely occurs east of the mouth of the Kennebec, nor has it been collected in the maritime provinces of Canada. In fact, north of Cape Anne the three species (excepting the local *S. linearis* of southern Maine) which we know are low plants of procumbent or at least wide-spreading or loosely branching habit. Michaux supposed the lower St. Lawrence plant to be the European *Salsola salsa*, and his primary descripion might well be that of the Old World plant; but in the accompanying observation he states that his American specimen differs from the European in its more slender subdecumbent habit and more crowded flowers.[1] The Michaux plant was soon distinguished by Persoon from the erect *Salsola salsa* as a variety, "*β? americana*, humilior, subdecumbens, flor. confertioribus."[2]

[1] "A. Salsola quæ maritima circa *Hâvre de Grace* et *Dieppe* incolit, in eo tantum differt, quod humilior sit et subdecumbens, floribus confertioribus."— Michx. Fl. i. 174 (1803).

[2] Pers. Syn. i. 296 (1805).

Subsequently the Michaux plant, as already stated, has been doubtfully placed by Moquin and others under the more southern *Suaeda linearis*, and by Dr. Watson it was included as a synonym under his tall erect but later discarded var. *ramosa*. And more recently, in the Illustrated Flora, Dr. Britton has taken up for the well-known Atlantic coast plant with "stem erect, strict, 1°–3° tall," the name used by Persoon to designate a "low subdecumbent" plant; and regarding Michaux's subdecumbent plant from the lower St. Lawrence as identical with the more southern erect species, he makes the new combination *Dondia Americana* (Pers.) Britton.

In the summer of 1903 the writer examined the Michaux type and at that time made the note: "Loosely branching *Suaeda*, very immature, but from the crowding of the flowers seems to be the same as the Norwood Cove and Wells Beach species of late September and October." This plant of Norwood Cove and Wells Beach (no. 5 of the preceding notes) is well characterized not only by its late fruiting and subprostrate habit but by its densely crowded flowers on spiciform branches, its very irregular calyx, and its rich claret-color in autumn; and it is apparently the plant intended by Persoon as *Salsola salsa*, var. *americana*.

The northeastern maritime Suaedas as understood by the writer may be classified as follows —

* Seed 2 mm. broad.

Suaeda maritima (L.)Dumort. Comparatively low, 0.5–4 (rarely 5 or 6) dm. high, ascending or depressed, subsimple or with spreading-ascending or decumbent subsimple branches, often even forming depressed mats 5 dm. or less in diameter: leaves usually more or less glaucous, linear, acute or obtusish, semicylindric, flat above, convex beneath, 5 cm. or less long; those of the flowering branches slightly shorter than the others and much exceeding the 1–4 axillary flowers: sepals pale-green, rounded or obscurely keeled on the back: seed red-brown or black.— Fl. Belg. 22 (1827); Moq. Ann. Sci. Nat. xxiii. 308 (1831), and Chenop. Enum. 127 (1840). *S. maritima α vulgaris* Moq. Chenop. Enum. 128 (1840). *S. linearis* Watson, Proc. Am. Acad. ix. 87 (1874) in part; Wats. & Coult. in Gray, Man. ed. 6, 435 (1890) in part; not Moq. *Chenopodium maritimum* L. Sp. 221 (1753); Oeder, Fl. Dan. iii. t. 489 (1770); Walter, Fl. Car. 111 (1788); Sm. Engl. Bot. ix. t. 633 (1799). *Atriplex maritima* Crantz, Inst. i. 208 (1766). *Salsola maritima* Poir. Encyc. vii. 291 (1806). *Schoberia maritima* C. A. Meyer in Ledeb. Fl. Alt. i. 400 (1829). *Cheno-*

podina maritima Moq. in DC. Prodr. xiii. pt. 2, 161 (1849). *C. maritima, a vulgaris* Moq. l. c. *Dondia maritima* Druce, Ann. Scot. Nat. Hist. (1896) 42; Britton & Brown, Ill. Fl. i. 585, t. 1394 (1896).— Common on wet marshes along the coast from Anticosti to Connecticut, and occasionally southward to Louisiana. Eurasia.

Walter's specimen of his *Chenopodium maritimum* from the Carolina coast is not readily distinguished from this, though his description is cited by Elliott under *Salsola linearis*. On the Massachusetts coast and southward the ascending bushy form of the plant prevails, but from Ipswich northward along the coast of Maine and Eastern Canada it often gives way to a more depressed and usually more glaucous plant, which, however, cannot be clearly separated from the other form. Apparently the same forms in the British Isles have a distribution parallel with this, for, according to Syme "the erect variety is more common in the south, the procumbent in the north; but it is scarcely possible to draw any line of demarcation between them" (Engl. Bot. ed. 3, viii. 4.).

* * Seed 1.25 to 1.5 mm. broad.

+— Sepals rounded on the back, not carinate.

S. Richii. Stems procumbent, forming mats 5 dm. or less across (often fruiting when only 1 cm. or so long): leaves dark green, not at all glaucous, linear to linear-oblong, bluntish, subcylindric, dorsally compressed, the lower 1.5 cm. or less in length; those subtending the fascicles of flowers broader and shorter (4 or 5 mm. long): seed black. — Common on salt marshes and in damp spots at the edge of the beach, Wells, Maine, Aug., 1892 (*Anne E. Perkins*), Sept. 16, 1895 (*Walter Deane*), July 23, 1898, TYPE (*J. C. Parlin & M. L. Fernald*), Sept. 1898 (*Kate Furbish*); also on Great Cranberry Isle, Maine, Aug. 30, 1892 (*E. L. Rand*), and at Cutler, Maine, Aug. 27, 1902 (*M. L. Fernald*). A very distinct species, in its procumbent habit suggesting the depressed form of *S. maritima*, but, in the field, quickly distinguished by its short blunt dark (not glaucous) green foliage, as well as its small seed. From the other small-seeded species, *S. linearis*, it is distinguished by its procumbent habit and short blunt leaves, as well as by the rounded (not carinate) sepals. Unlike any other American plant, this Suaeda in habit strongly suggests *S. microsperma* (C. A. Meyer) Fenzl, but that Asiatic plant has much smaller seeds, and the sepals cucullate-carinate.

This procumbent small-seeded plant of the Maine coast is named for William Penn Rich, a discriminating student of salt marsh vegetation, who in April, 1898, pointed out in the herbarium of Mr. Walter Deane the peculiarities of the species here described.

+— +— Sepals (or some of them) carinate on the back.

++ Stems procumbent: 1 or 2 sepals more cucullate-carinate than the others.

S. americana (Pers.) n. comb. Stems procumbent, the branches 2 or 3 dm. long, only the abundant flowering ones ascending: lower leaves linear, acute, about 2 cm. long; those of the densely-flowered ultimate branches broader and much shorter: one or two sepals usually much more cucullate-carinate than the others: entire plant generally becoming, in the autumn, a rich crimson-lake or claret-color. — *Salsola salsa* ? Michx. Fl. i. 174 (1803), not L. *S. salsa*, *β.* ? *americana* Pers. Syn. i. 296 (1805). *Dondia americana* Britton in Britton & Brown, Ill. Fl. i. 584, merely as to name-bearing synonym (1896).— Salt marshes, maturing from late September to November. Known only from the original Michaux material from the lower St. Lawrence, and from two stations on the coast of Maine,— Norwood Cove, Southwest Harbor, September 18, 1892 (*M. L. Fernald*) and Wells Beach, late September, 1898 (*Kate Furbish*); but in its very procumbent habit, dense subspicate inflorescence, and generally irregular calyx, apparently a very distinct species.

++ ++ Stems erect or ascending: sepals equally carinate.

S. LINEARIS (Ell.) Moq. Erect or ascending, 2 to 9 dm. high, profusely branched; the slender branches ascending or sometimes wide-spread, but not procumbent: leaves narrowly linear, dark green (not glaucous), 4 cm. or less long, those of the slender elongated flowering branches much shorter: sepals equally carinate.— Chenop. Enum. 130 (1840); Wats. Proc. Am. Acad. ix. 87 (1874), at least in part; Wats. & Coult. in Gray, Man. ed. 6, 435 (1890), in part ; Chapm. Fl. ed. 3, 406 (1897). *S. linearis*, var. *ramosa* Wats. l. c. (1874), excluding syn. *Salsola salsa* Michx. & *S. salsa*, var. *americana* Pers. *S. maritima* Torr. (*Sueda*) Fl. N. Y. ii. 141 (1843); Gray, Man. 377 (1848); not Dumort. *Chenopodium maritimum* Pursh, Fl. 198 (1814), not *L. Salsola linearis* Ell. Sk. i. 332 (1817). *Chenopodina linearis* Moq. in DC. Prodr. xiii. pt. 2. 164 (1849). *C. maritima* Gray, Man. ed. 2, 366 (1856); Chapm. Fl. 378 (1860); not Moq. *Dondia Americana* Britton in Britt. & Brown, Ill. Fl. i. 584, t. 1393 (1896), excluding syn. *Salsola salsa*, var. *americana* Pers.— On the seacoast, chiefly in dryish sand or at the borders of marshes, from Maine to Texas; rare east of the Kennebec.

Gray Herbarium.

Flower Color of the American Diervillas.— The change in flower color which follows pollination in the Asiatic species of *Diervilla* § *Weigela* is often cited as a striking case of adaptation to pollination by bees. In all but one of the Weigelas the flowers are at first white or merely roseate-tinged, but after pollination they change quickly to deep rose or carmine, in which condition they remain fresh for some length of time, serving to attract bees to the shrub. Only the white flowers are visited for honey, however. Among the American species of *Diervilla*, which belong to a section of the genus distinguished from § *Weigela* by the smaller yellow flowers, the corresponding phenomenon seems to have been recorded only by Mrs. Dana. In "How to know the Wild Flowers" she says of *Diervilla Lonicera* Mill. (*D. trifida* Moench): "The lower lobe of the corolla is crested and more deeply colored than the others, thus advising the bee of secreted treasure. . . . .When the blossom has been despoiled and at the same time fertilized, for the nectar-seeking bee has probably deposited some pollen upon its pistil, the color of the corolla changes from a pale to a deep yellow. . . ." Other observers have noticed that the flower of this species is not always "light yellow" or "honey yellow," but have apparently ascribed the differences to specific variability.

In shady woods the change in *Diervilla Lonicera* is not very noticeable, but in dry localities where the growth of the shrub is stunted, as for example on Mt. Chocorua, N. H., and on the summit of Great Blue Hill, near Boston, the flowers become deep scarlet. The lip is the first part to show signs of change and it remains always of a deeper hue than the rest of the corolla, becoming, on Blue Hill, almost maroon. At the Arnold Arboretum, where all the American Diervillas are cultivated under moderate conditions of shade and moisture, fresh flowers were compared with Ridgway's standard color scale and the following changes noted. In *D. Lonicera* Mill. the corolla is at first citron yellow. The lip changes to poppy red and the other lobes to scarlet. In *D. rivularis* Gattinger the change is from yellow to a lightly suffused, dull poppy red, most intense on the lip. In *D. sessilifolia* Buckley the citron yellow corolla changes to cadmium yellow except on the lip, which becomes orange. *D. splendens* Carrière, which Mr. Rehder is inclined to consider a hybrid between *D. Lonicera* and *D. sessilifolia*, changes from canary yellow to pale orange, with an orange lip. In this character, as well as in its time

of flowering, it resembles the latter of its supposed parents.— H. H. Bartlett, Gray Herbarium.

Maclura pomifera (Raf.) Schneider.— In the May issue of Rhodora (ix. 91) I noted the fact that the Osage Orange, a common hedge plant of the Middle West and an occasional escape from cultivation in New England, should according to the Vienna Rules of nomenclature bear the name *Maclura pomifera*. I was not aware at the time that this particular combination had been used in print. Through the kindness of Mr. Alfred Rehder of the Arnold Arboretum I learn that the binomial *Maclura pomifera* was published about a year earlier in a short supplement of the first volume of C. K. Schneider's detailed Illustriertes Handbuch der Laubholzkunde (i. 806). — B. L. Robinson, Gray Herbarium.

Vol. 9, no. 103, including pages 109 to 124, was issued 12 August, 1907.

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